

NEW ENGLAND NOTE

ANEURA MAXIMA (HEPATICAE: ANEURACEAE) IN
MAINE, U.S.A.

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Aneura maxima (Schiffn.) Steph. Maine: Kennebec Co., Mud Pond, ca. 5 km SW of Litchfield along Highway 126, 44°12'N, 69°58'W, bottom of an animal run over wet peat, minerotrophic edge of fen mat near pond, 19 Sep 1987, *Miller 9497* (NYS).

Two species of *Aneura* are recognized in the North American flora by Schuster (1992), the common and variable *A. pinguis* (L.) Dumort., and *A. maxima*, a species only recently discovered to be widespread in eastern North America but previously known in the flora of tropical and temperate Asia. A third species, *A. sharpii* Inoue & N. G. Mill. (Inoue and Miller 1985) has also been recognized, but in this note I tentatively accept it as a synonym of *A. maxima*, following the circumscriptions and interpretations of Schuster (1992).

Aneura maxima is based on plants first collected in Java and Sumatra (Schiffner 1898). Its known range was subsequently extended to include other parts of Asia, notably Japan, eastern North America (Schuster 1992), and very recently western and northwestern Europe (Finland, Frahm 1997; Belgium, Andriessen et al. 1995; France, Sotiaux and Sotiaux 1996). The pattern of morphological variation in North American populations of *A. maxima sensu lato* is poorly understood, because the species has been collected infrequently so far in our area, and male plants and female ones with mature calyptrae and sporophytes are few or unknown throughout the range of the species.

There is only one previous station for *Aneura maxima* in New England, namely, Rutland County, Vermont, in a fen near the Connecticut River (as *A. sharpii*; Inoue and Miller 1985). Otherwise, the reported North American distribution of *A. maxima* (incl. *A. sharpii*) is eastern New York State, central Pennsylvania, West Virginia, Tennessee, Mountain and Piedmont provinces of

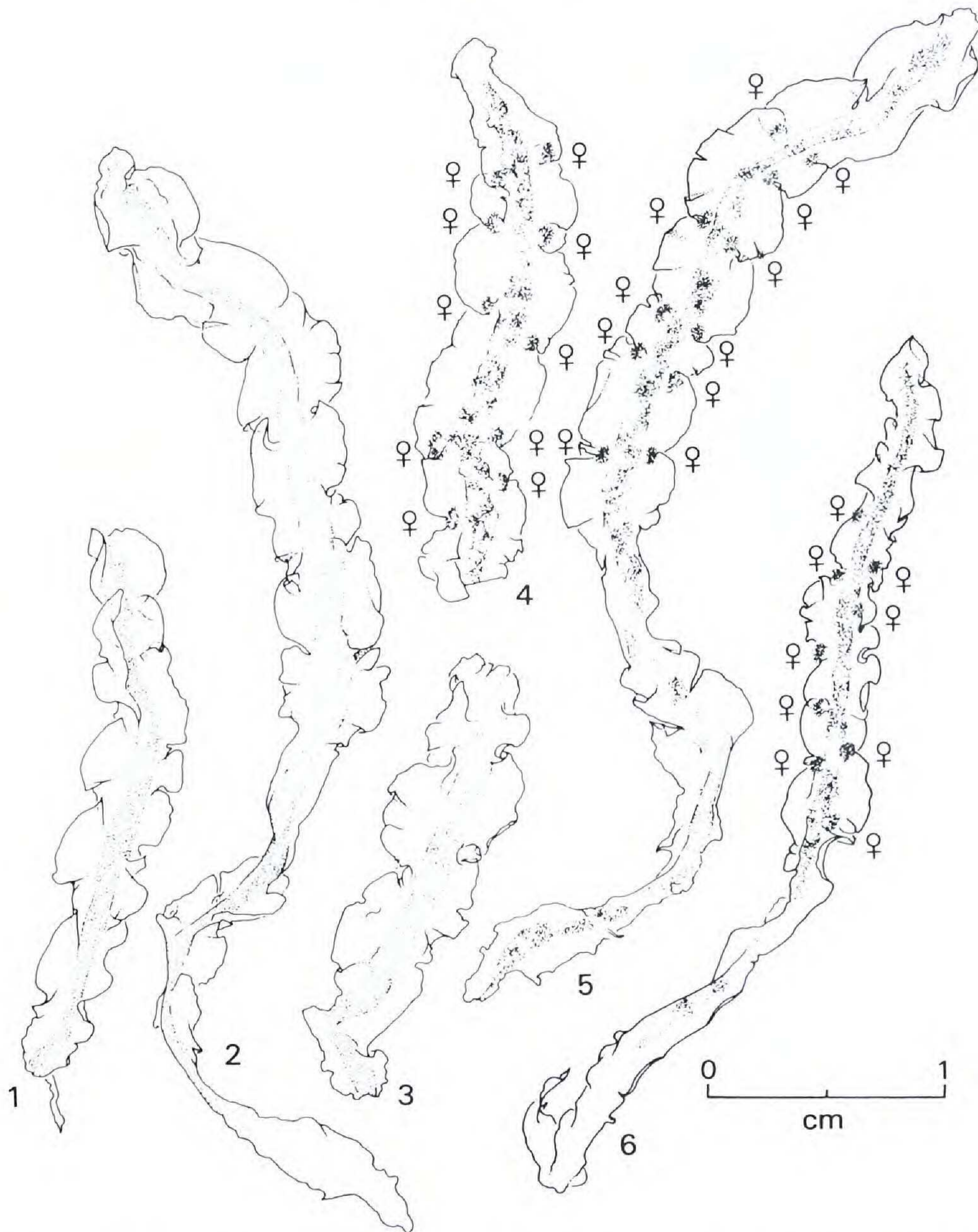
North Carolina, and Louisiana (Inoue and Miller 1985; Reese and Walters 1987; Schuster 1992). *Aneura maxima* appears to be uncommon in all these regions.

Aneura maxima and *A. pinguis* differ vegetatively in the following ways: thallus margins regularly lobate, short, lateral archegonial branches (gynoecia) in most sinuses; unistratose thallus wings 10–20 cells wide, sometimes more; thick, opaque, multistratose mid-thallus region narrow, about one-third of the plant width (*A. maxima*; Figures 1–6), versus thallus margins only sometimes irregularly and unevenly lobate or sinuate, lateral sinuses bearing archegonial branches scattered; unistratose thallus wings when developed (especially in lax plants from moist or wet habitats) to 10 cells wide but usually fewer; thick mid-thallus region wide, sometimes the entire width of the plant, but usually two-thirds (or more) of the plant width (*A. pinguis*; Figures 7, 8).

Thalli of *Aneura maxima* are similar to those of *Pellia* and *Moerckia*. When present, the short, lateral, ciliate archegonial branches of female plants of *A. maxima* (visible only from the underside of plants) easily separate species of *Aneura* from those of the other two genera. In plants of *Pellia* and *Moerckia*, sex organs are variously disposed on the upper thallus surface. Antheridial branches of male plants of *A. maxima* are also short and lateral, but they extend beyond the thallus margins and therefore can be seen from the upper surface of the plant.

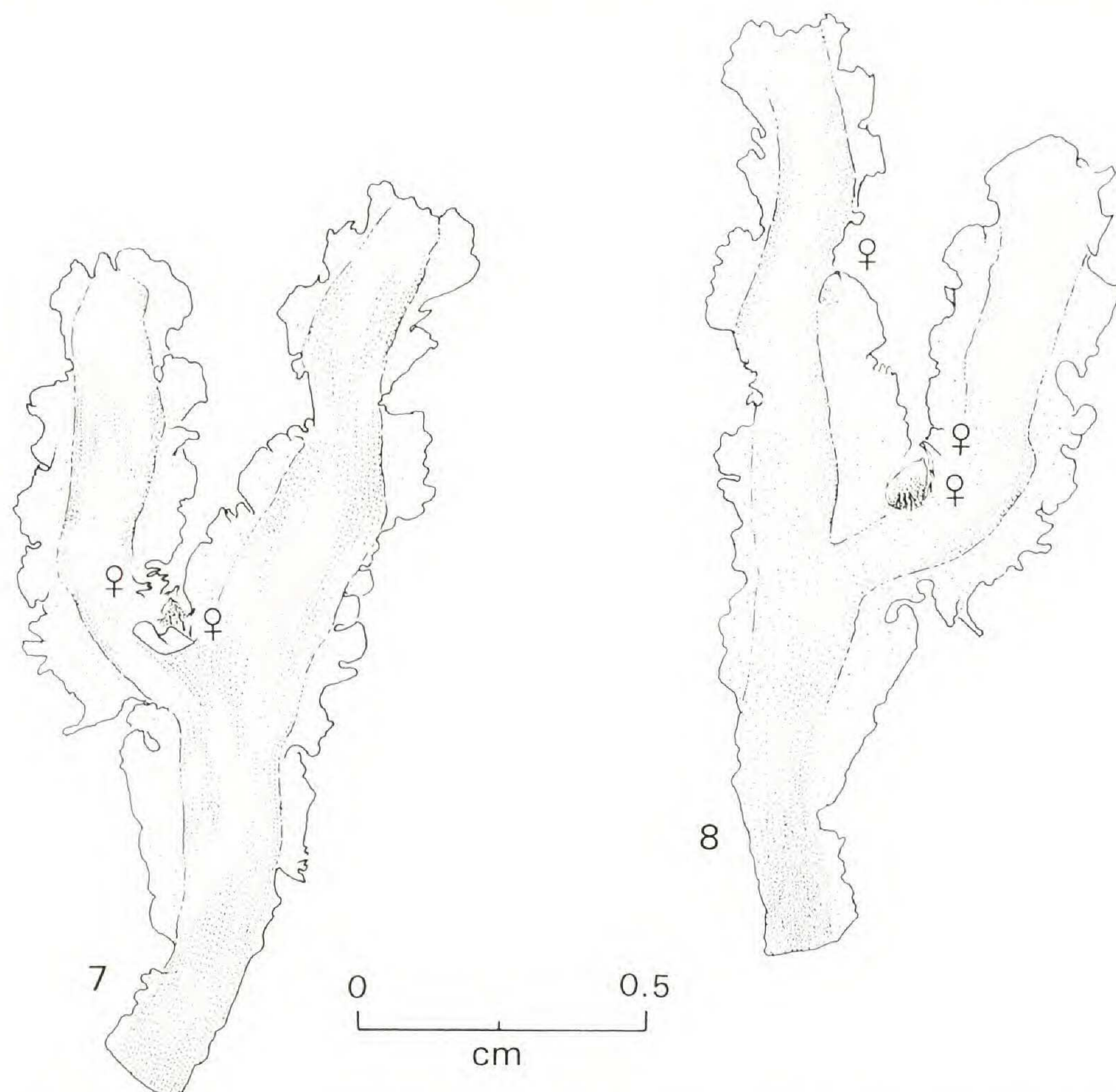
Too few plants of *Aneura maxima* with calyptrae and mature sporophytes are known at present in North America to evaluate potential differentiating character states in these life cycle components. Schiffner (1900), Furuki (1991), and Schuster (1992) stressed that the female inflorescences of *A. maxima* contain long or very long cilia (paraphyses, *sensu* Furuki 1991), whereas in *A. pinguis* they are scalelike (Schuster 1992). However, in young archegonial branches (i.e., those with archegonia cap cells intact) in North American plants I have studied, uniseriate and multiseriate, scalelike paraphyses are present in both *A. maxima* and *A. pinguis* (Figures 9–22). Therefore, at a young stage of development, it does not seem possible to differentiate between the species on the basis of paraphysis morphology. However, this may not hold for plants with mature calyptrae.

Plants of *Aneura pinguis* can be highly variable throughout its nearly cosmopolitan range, but one segment of the variation approaches *A. maxima* in thallus morphology. In a frequently en-



Figures 1–6. *Aneura maxima*. 1–3, thalli, upper surfaces, note lobate wings and narrow mid-thallus rhizoidal region where the thallus is also thickest; 4–6, thalli, lower surfaces, note the regular and repetitious occurrence of archegonial branches, which remain small and cushion-like [Maine, *Miller 9497* (NYS)].

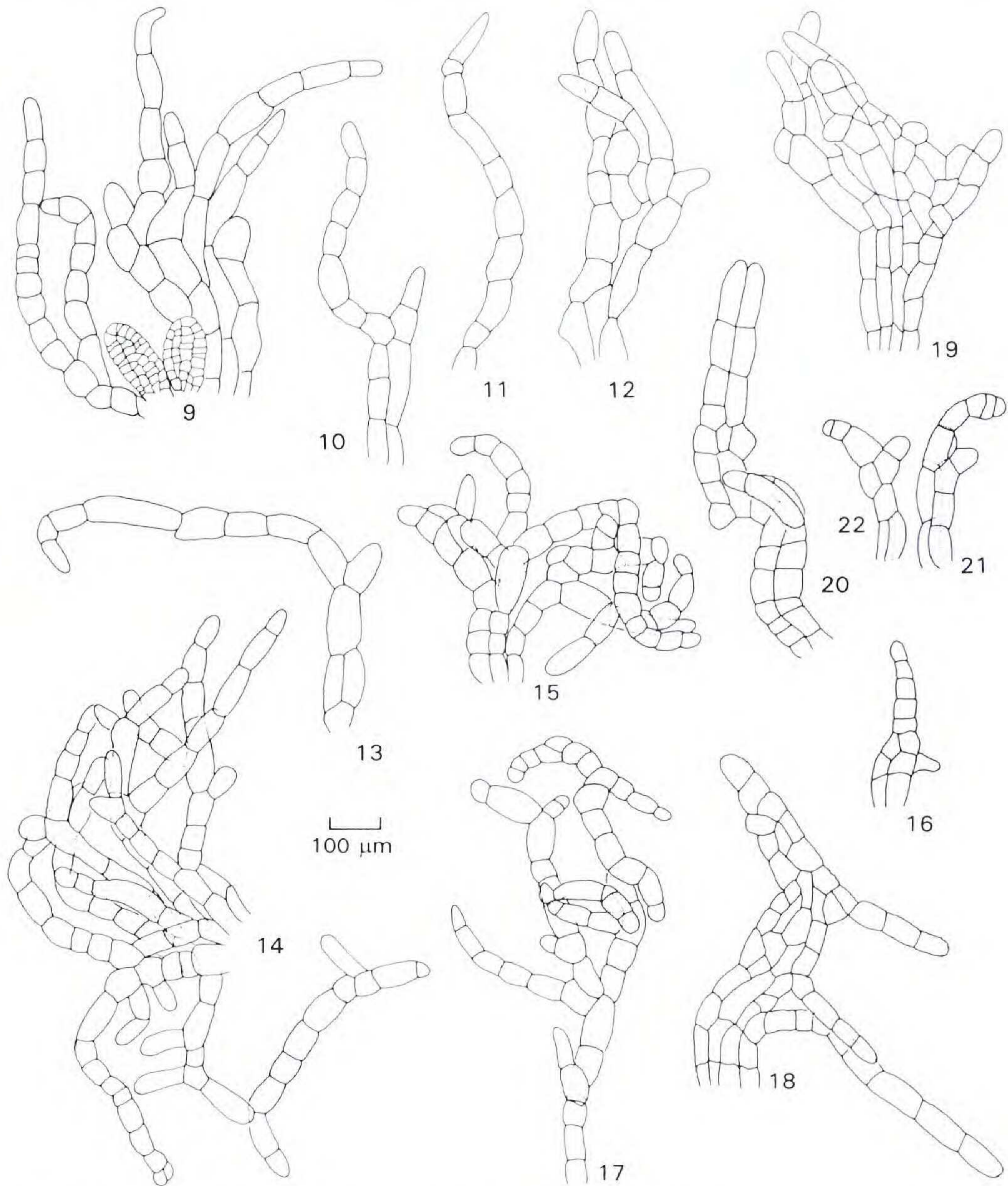
countered expression of *A. pinguis*, the plants are an oily or greasy green, compact, brittle, and multistratose to the margins. However, lax plants in wet habitats can have lateral wings similar to those of *A. maxima* but without the regular lobate configuration of this species. Illustrated in Figures 7 and 8 are the obverse and reverse aspects of the same plant of *A. pinguis* from a wet, shrub-



Figures 7 & 8. *Aneura pinguis*, plant from a wet habitat (circumneutral carr). 7, thallus, upper surface, note irregular, mostly nonlobate wings and broad, thick mid-thallus region; 8, same plant, lower surface of thallus, archegonial branches few and irregular in position [Maine, Aroostook Co., Thousand Acre Bog, Crystal, *Miller 13262* (NYS)].

by fen margin in north-central Maine. The lateral thallus wings in this plant and others in the collection are up to 10 cells wide and the cells are arranged in fan-shaped tiers, suggesting that they grew out from the edge of the massive tissue in the central part of the thallus. Plants of this morphological type retain the wide, thick central thallus region and irregularly placed archegonial branches typical of compact expressions of *A. pinguis* in drier sites.

In the northern portion of its known range in eastern North America (New England and New York), *Aneura maxima* has been found on wet peat in fens beneath a shrub or herb cover and on



Figures 9–22. *Aneura maxima* and *A. pinguis*, filiform and scalelike archegonial paraphyses, all from archegonial branches at the same stage of development. 9–13, *A. maxima*, showing variation from filiform and simple to multiseriate and branched, archegonia in 9 semidiagrammatic [Maine, *Miller 9497* (NYS)]; 14–18, *A. pinguis*, from a lax plant in a hygric habitat [Maine, *Miller 13262* (NYS)]; 19–22, *A. pinguis*, from a compact plant in a mesic habitat [Michigan, Cheboygan Co., shore of Weber Lake, *Miller 9016* (NYS)].

wet organic-rich muck in a *Lythrum salicaria* L. wetland under a dense, tall, herb overstory. To the south in West Virginia, Tennessee, North Carolina, and Louisiana, it grows perhaps exclusively on wet rock in streams and over cliff faces, and on stream banks.

LITERATURE CITED

- ANDRIESEN, L., A. SOTIAUX, C. NAGELS, AND O. SOTIAUX. 1995. *Aneura maxima* (Schiffn.) Steph. in Belgium, new for the European liverwort flora. *J. Bryol.* 18: 803–806.
- FRAHM, J.-P. 1997. A second European record for *Aneura maxima* (Schiffn.) Steph. in Finland. *Lindbergia* 22: 99.
- FURUKI, T. 1991. A taxonomical revision of the Aneuraceae (Hepaticae) of Japan. *J. Hattori Bot. Lab.* 70: 293–397.
- INOUE, H. AND N. G. MILLER. 1985. A new *Aneura* (Hepaticae: Aneuraceae) from eastern North America. *Bull. Natl. Sci. Mus., Tokyo, B.* 11: 95–101.
- REESE, W. D. AND D. A. WATERS. 1987. Two bryophytes new to Louisiana. *Castanea* 52: 147.
- SCHIFFNER, V. 1898. *Expositio plantarum in itinere suo indico annis 1893/94 suscepto collectarum speciminibusque exsiccatis distributarum, adjectis descriptionibus novarum. Series prima. Hepaticarum partem continens.* *Denkschr. Kaiserl. Akad. Wiss., Wien. Math.-Naturwiss. Kl.* 67: 153–203.
- . 1900. *Die Hepaticae der Flora von Buitenzorg, Vol. I.* Brill, Leiden, Netherlands.
- SCHUSTER, R. M. 1992. *The Hepaticae and Anthocerotae of North America East of the Hundreth Meridian, Vol. 5.* Field Museum of Natural History, Chicago, IL.
- SOTIAUX, A. O. AND M. SOTIAUX. 1996. *Aneura maxima* (Schiffn.) Steph., hépatique nouvelle pour la flore française. *Bull. Soc. Bot. Centre-Ouest* II. 17: 513–516.